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1: Gene. 1991 Mar 1;99(1):15-23.

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Cloning an Escherichia coli gene encoding a protein remarkably similar to mammalian aldehyde dehydrogenases.

Heim R, Strehler EE.

Laboratory for Biochemistry, Swiss Federal Institute of Technology, CH-805 Zurich.

The nucleotide (nt) sequence of 2.9 kb of Escherichia coli genomic DNA that encompasses a gene encoding a putative aldehyde dehydrogenase (ALDH) has been determined. The presence of an open reading frame beginning 2 nt downstream from the ALDH-coding sequence indicates that this gene may be part of a larger operon. An extended upstream nt sequence displays striking similarity to sequences found upstream or in intergenic regions of a number of other bacterial genes. Crude cell extracts from E. coli grown under several different conditions show weak but measurable ALDH enzyme activity that prefers NADP⁺ over NAD⁺ as coenzyme; however, aldH gene expression appears to be very low, since no specific transcripts derived from the novel gene can be detected on Northern blots of RNA isolated from these cells. The deduced E. coli protein contains 495 amino acid (aa) residues with a calculated Mr of 53418. Its aa sequence showed marked similarity to NAD(+) dependent ALDHs of eukaryotes. About 40% aa sequence identity, and over 60% similarity, are detected between the E. coli protein and both the cytosolic (class-1) and the mitochondrial (class-2) forms of mammalian ALDHs. In contrast to the mammalian enzymes, which contain eight to eleven Cys residues, only four Cys are present in the E. coli protein, and of these only Cys302, corresponding to the disulfiram-sensitive residue in the mammalian enzymes, is found at a conserved position in both the prokaryotic and the eukaryotic ALDHs. The availability of a bacterial ALDH with a high degree of similarity to mammalian ALDHs promises to facilitate future structural studies on these enzymes.

PMID: 1840553 [PubMed - indexed for MEDLINE]